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(54) Drive shaft connector

(57) A separable drive shaft connector is described which comprises a cone shaped male member 26 and a cooperating female member 18 having a recessed end to receive the male member. Radial drive flanges 22 on the male member engage in axial slots 24 in the end of the female member. One of the members, the male member as shown, incorporates an Oldham coupling of which the elements are resiliently biassed into alignment by elastic bands 40, 42. The application of such a drive connector to a withdrawable paper tray unit in a photocopier is also described.

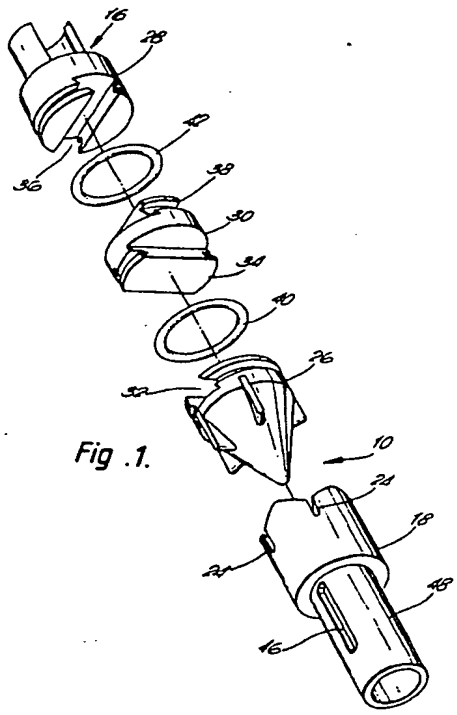
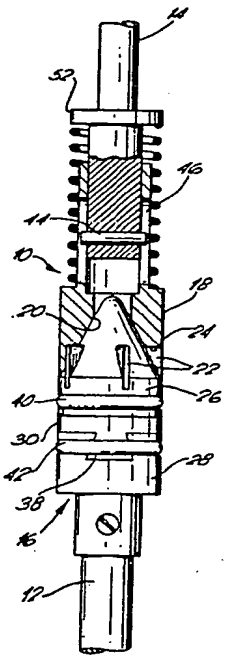


Fig .1.

Fig .3.



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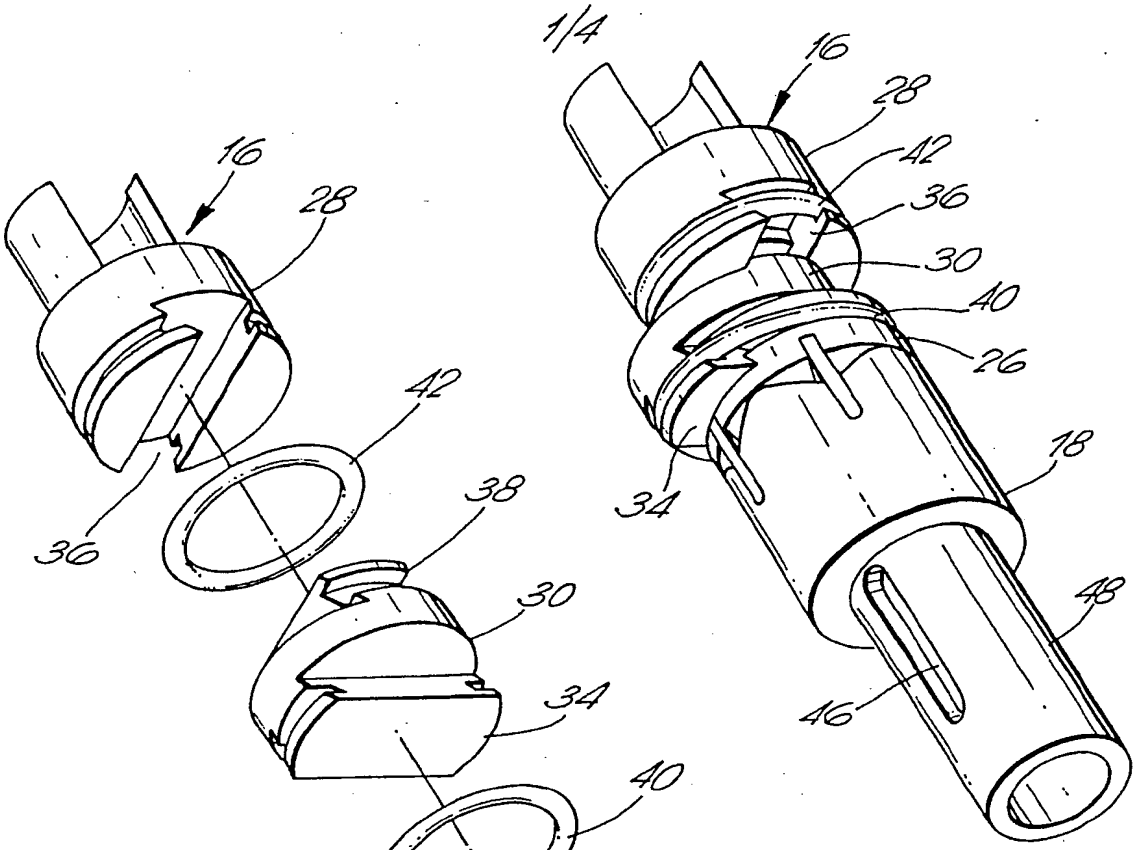


Fig . 5.

Fig . 1.

Fig . 2.

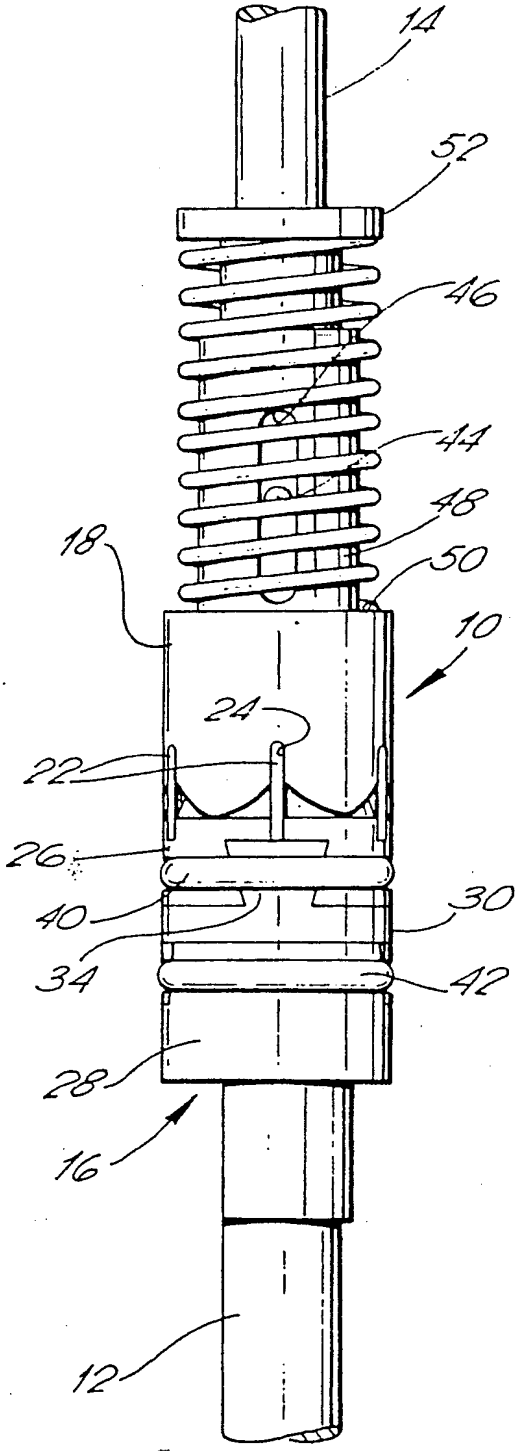
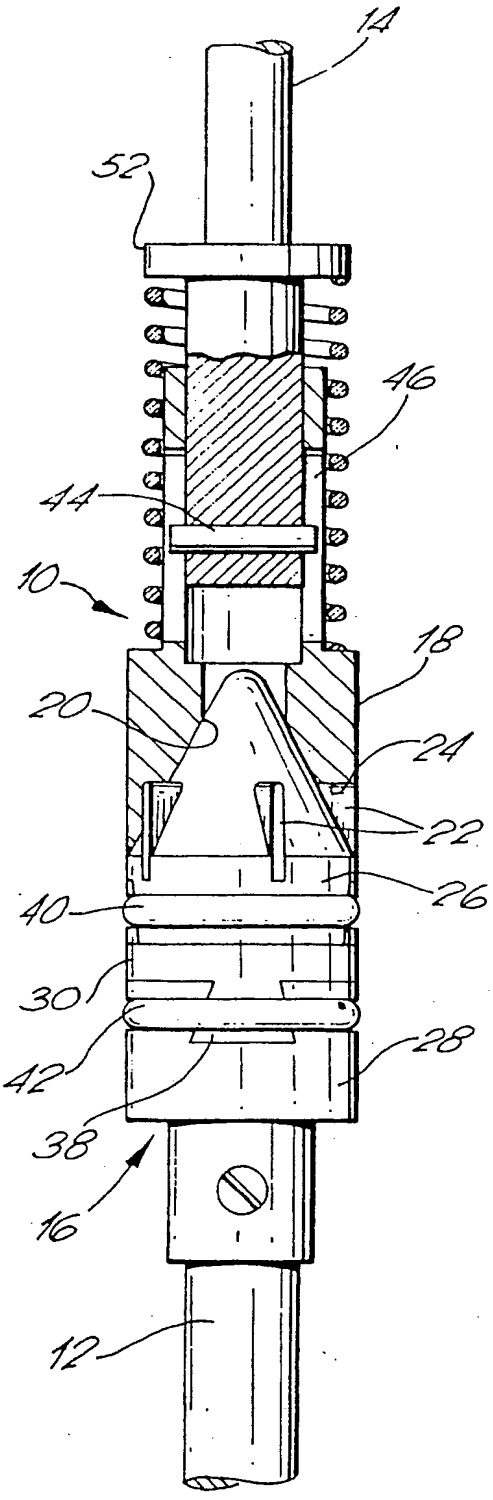


Fig . 3.



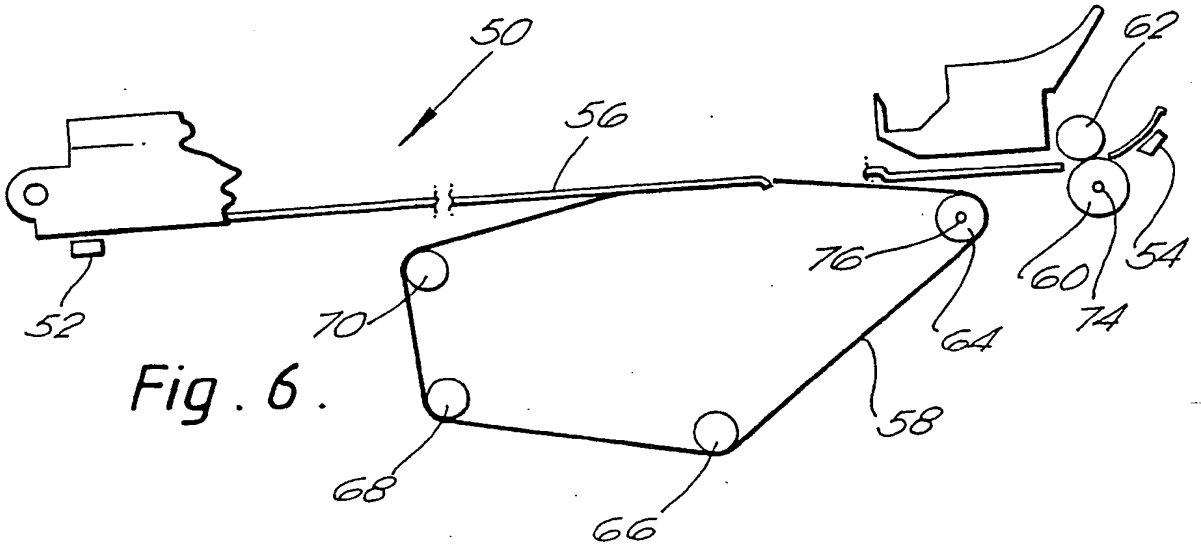


Fig. 6.

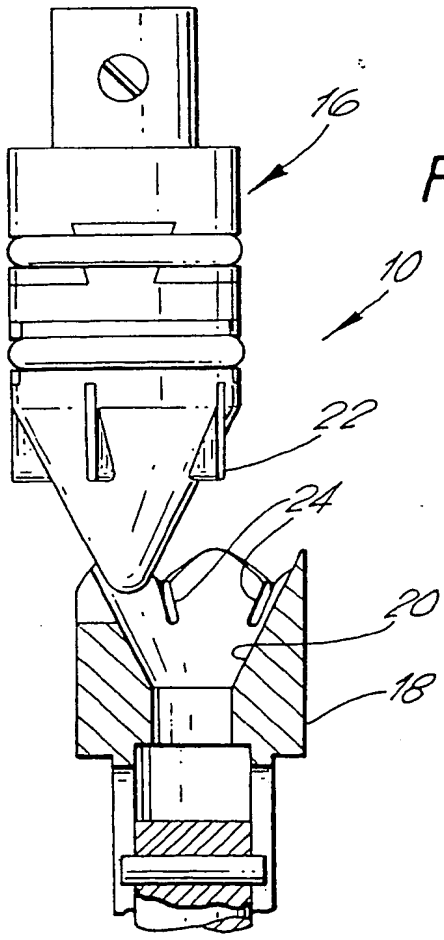


Fig. 4.

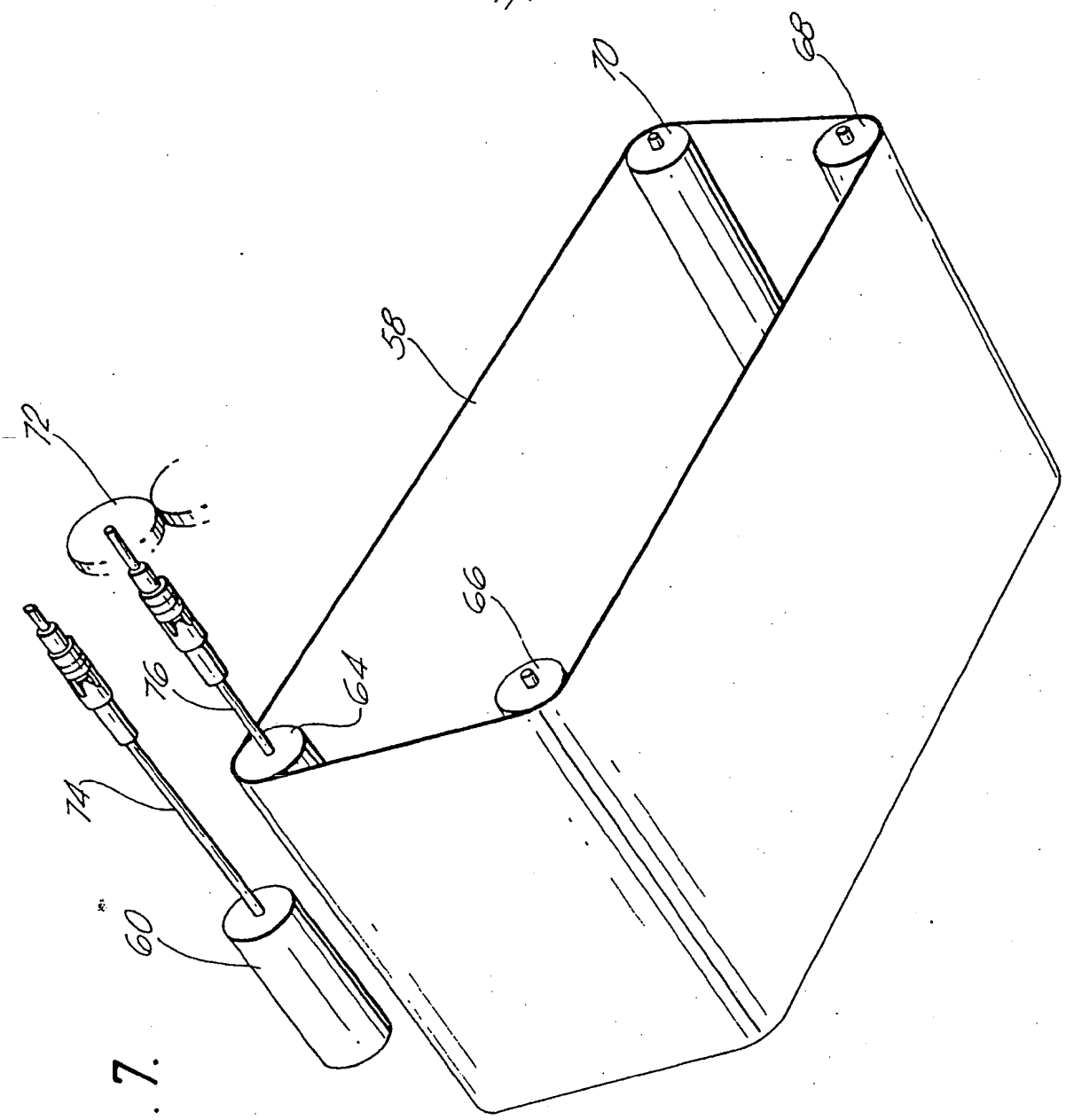


Fig. 7.

SPECIFICATION

Drive shaft c nnector

This invention relates to a separable drive shaft connector for drivingly connecting the parts of a shaft which have to be separated when a drive member and driven member connected by the shaft are moved apart. This may be required for example where a withdrawable unit of a photocopier incorporates a driven member which is driven off a fixed drive at the back of the copier. It will be understood that when a unit such as a copy sheet tray has to be moved in and out of a copier such as for paper replenishment and jam clearance, it may not be possible possible to ensure exact alignment of the shaft ends and any misalignment for example as a result of tolerance build-up and the like must be accommodated by the connector.

It is an object of the present invention to provide a separable shaft connector which permits drive connection between the parts of the shaft even though these may be misaligned within limits.

To this end there is provided in accordance with the invention a separable drive shaft connector comprising a cone shaped male member and a cooperating female member having a recessed end to receive said male member, and interengaging drive means on said members, one of said members incorporating a coupling comprising a pair of end elements between which a floating disk element is supported by cooperating diametral slots and tongues on the opposing faces, the slot and tongue connecting one end element to the disk element being normal to the slot and tongue connecting the other element to the disk element, said coupling having means resiliently biasing the elements of said coupling into alignment while permitting misalignment thereof during engagement of the members.

A three element coupling connected by tongues and grooves as described above is known as an Oldham coupling.

In a preferred embodiment each end element of the coupling is resiliently connected to the disk element by an elastic band arranged in a peripheral channel which extends through the ends of the connecting tongue and around the associated slotted element. These elastic bands are suitably O-rings. The connecting tongues are suitably formed on the opposed faces of the floating disk element.

Advantageously, the interengaging drive means comprises radial flanges on said cone shaped member and cooperating axial slots in the end of said female member.

From another aspect the invention provides a copier having a withdrawable unit, such as copy sheet tray, incorporating a driven member, a fixed drive and a drive shaft connecting said fixed drive to said driven member which incorporates a separable drive shaft connector as described above.

In order that the invention may be more readily understood reference will now be made to the accompanying drawings, in which:–

Figure 1 is an exploded perspective view of a separable drive shaft connector according to the present invention,

Figure 2 is a side elevation of the connector,

Figure 3 is a view like that of Fig. 2 showing the connector partly in cross section,

Figure 4 illustrates the way in which the parts of the connector may interengage when misaligned,

Figure 5 shows the members fully engaged and illustrating how misalignment is accommodated,

Figure 6 illustrates an embodiment of paper tray of a copier according to the invention, and

Figure 7 is a scrap view of the tray schematically showing two drive connectors of this invention incorporated therein.

Referring to Figs. 1 to 5 of the drawings there is shown a separable drive shaft connector 10 according to the invention for connecting drive shaft sections 12 and 14 end to end so that they will rotate together. The connector 10 comprises a cone shaped male member 16 and a cooperating female member 18 having a cone shaped recessed end 20 to receive the male member. When the members 16, 18 are pushed together radial flanges or webs 22 on the male member engage in axial slots 24 in the end of the female member. To assist in guiding the parts together the entrances to the slots 24 are V shaped.

The male member 16 incorporates a so-called Oldham coupling. To this end the member 16 is in three parts, that is to say end elements 26, 28 between which a floating disk element 30 is arranged. The parts are connected by cooperating diametral slots and tongues 32, 34 and 36, 38. As best seen in Fig. 1 the slots 32, 36 are formed in the end elements 26, 28 respectively and the tongues 34, 38 are formed on opposite faces of the floating disk element 30. As also clearly seen from Fig. 1 the slot 32 and tongue 34 are normal to the slot 36 and tongue 38. This arrangement permits the cone element 28 to move in two orthogonal directions with respect to the element 26 fixed to the shaft permitting universal relative movement of the end elements.

As seen in Fig. 4 the maximum misalignment which can be accommodated in the shafts by the connector is determined by the size of the opening of the recess in the end of the female member and may for example be 6mm. To ensure that the misalignment is not compounded by misalignment between the

elements of the male member itself these are biassed into alignment by elastic bands 40, 42 which resiliently connect respective end elements of the coupling to the disk element. Each band, which suitably takes the form of a rubber O-ring, is arranged in a circumferential channel which extends through the ends of the respective tongue 34, 38 and the outside of the associated slotted element 32, 36.

In the embodiment illustrated the male member 16 is rigidly fixed to its shaft end 12 but to accommodate axial variations the female member 18 is resiliently mounted on the end of its shaft end 14. Thus the female member is slidably mounted on the end of the shaft section 14 and radial pins 44 on the shaft 14 engage in slots 46 in a tubular portion 48 of the female member while a compression spring extends between a shoulder 50 on the female member and a flange 52 on the shaft 14.

As will be seen from Fig. 4 so long as the end of the cone shaped male member 16 is within the mouth of the female member when the parts are brought together, the mating surfaces of the two members will slide over one another so that the male cone member 16 enters the recess in the female member 18 as shown in Fig. 3. The misalignment between the shaft ends is accommodated by the elements of the male member shifting with respect to one another against the action of the elastic bands 40, 42 as shown in Fig. 4. As the shaft sections rotate, the elements of the male member continuously adjust themselves to permit drive transmission between the shaft ends without distortion or binding.

One application of a shaft connector according to the present invention will now be described with reference to Figs. 6 and 7 which schematically illustrate a paper tray unit 50 of a photocopier which is mounted for sliding movement towards and away from the viewer on slides 52, 54 for withdrawing the paper tray from within the copier to give access thereto for paper replenishment and jam clearance. The tray includes a support surface 56 having a vacuum belt feeder 58 at the forward end thereof for feeding sheets out of the tray to take away rolls 60, 62 by which the sheet is advanced towards the photoreceptor of the photocopier. The vacuum feed belts of the feeder 58 are entrained over guide rollers 64, 66, 68 and 70. The nip roller 60 and the belt roller 64 are driven rollers which are driven off a fixed drive at the back of the photocopier (which is represented schematically in Fig. 7 by gears 72) through respective drive shafts 74 and 76. In accordance with the invention and as illustrated in Fig. 7, connectors 10 as described above are incorporated in each of the drive shafts 74, 76 to permit withdrawal of the paper tray.

While a particular embodiment of the invention has been described it will be understood that various modifications may be made to the specific details referred to herein without departing from the scope of the invention as defined in the appended claims.

CLAIMS

1. A separable drive shaft connector comprising a cone-shaped male member and a cooperating female member having a recessed end to receive said male member, and interengaging drive means on said members, one of said members incorporating a coupling comprising a pair of end elements between which a floating disk element is supported by cooperating diametral slots and tongues on the opposing faces, the slot and tongue connecting one end element to the disk element being normal to the slot and tongue connecting the other element to the disk element, said coupling having means for resiliently biassing the elements of said coupling into alignment while permitting misalignment thereof during engagement of said members.

2. A connector according to claim 1, in which each end element of the coupling is resiliently connected to the disk element by an elastic band arranged in a peripheral channel which extends through the ends of the connecting tongue and around the associated slotted element.

3. A connector according to claim 2, in which each elastic band comprises an O-ring.

4. A connector according to claim 1, 2 or 3, in which the connecting tongues are provided on opposite faces of the floating disk element.

5. A connector according to claim 1, 2, 3 or 4 in which the intergaging drive means comprises radial flanges on said cone-shaped member and cooperating axial slots in the end of said female member.

6. A connector according to any preceding claim, in which said coupling is incorporated in the male member.

7. A separable drive shaft connector constructed, arranged and adapted to operate substantially as hereinbefore described with reference to the accompanying drawings.

8. A copier having a withdrawable unit incorporating a driven member, a fixed drive and a drive shaft connecting said fixed drive to said driven member which incorporates a separable drive shaft connector according to any preceding claim.

9. A copier according to said claim 8, in which said unit is a copy sheet tray.

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